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EXAMINER	
MACARTHUR, SYLVIA	
ART UNIT	PAPER NUMBER
1763	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/07/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/822,093	BLOMILEY ET AL.	
	Examiner	Art Unit	
	Sylvia R. MacArthur	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3,13 and 23-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3,13 and 23-43* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 11/17/2006 have been fully considered but they are not persuasive. Namely, applicant argues that Omstead et al (US 6,544,341) teaches against the deposition of the copper (Cu) onto the backside of the susceptor and specifically teaches away from the deposition of Cu.

2. Recall, the prior art of Wang et al, AmRhein et al, or Stone et alwere used as *primary art* to teach a substrate using backside radiant heating, the susceptors of the primary art having a body as recited in claim 3 and constructed of graphite SiC. Neither of these susceptors taught an outer material on the susceptor comprising at least one of polycrystalline diamond and copper. It is the examiner's position that the claimed outer material of the susceptor is produced from the residual deposition of the susceptor while a substrate is deposited upon. The teachings of Omstead et al confirmed this position and teaches Cu is a known material of construction for thin films as recited in col. 2 lines 7-18. Thus, it was used as *secondary art*. Note col. 4 lines 20-25 teaches that when a copper film is deposited on a wafer, both the reaction chamber and the chuck tends to have a residual film of Cu upon the surfaces thereon. Though, Omstead et al teaches that this residual deposition inteferes with subsequent depositions it does/has occur(ed).

The amendment of claim 13 and the introduction of new claims 23-43 necessitated new search and consideration and resulted in the use of the prior art of Zimmer et al (US 6,054,183) which teaches the use of polycrystalline diamond as a coating material, the prior art of Osada et al (US 5,569,350) which teaches ring which physically support the wafer and is made of SiO2 (silicon dioxide) a material recited in the specification of the present invention (section [0078])

material that is transparent to IR. This ring has a non-solid space that is better observed see Fig.4 and the abstract when the pins lift the wafer above the susceptor. The prior art of Ohkase et al is introduced to show that sapphire, silica glass (silicon dioxide), and SiC graphite are equivalent materials as recited in col.13 lines 10-19.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 13, 31,32, 37-39, 41, and 42 are rejected under 35 U.S.C. 102(b) as being anticipated by Arasawa et al (Re 36,810).

Regarding claim 13:Arasawa et al teaches a substrate susceptor for physically supporting a semiconductor substrate to be deposited upon, the susceptor (chuck 18) comprising a body having a front substrate receiving side face comprising a body having a front substrate receiving side face comprising a bearing surface to physically support the semiconductor substrate to be deposited upon, a back side face, and a peripheral edge; the body comprising a ring (ring 22) having a radial inner portion at least a radial majority of which is non-solid space (gap between 22 and 18 as depicted in Fig. 6) extending from the front side face to the back side face, the bearing surface being received on said ring.

Regarding claim 31:The substrate susceptor of claim 13 wherein the ring has a radially innermost surface which is continuous and round, see Fig. 6

Regarding claim 32: The substrate susceptor of claim radial inner portion is centered relative to the body, see Fig. 6.

Regarding claim 37: The substrate susceptor of claim 13 wherein only a portion of the radial inner portion is non-solid space, see Fig. 6.

Regarding claim 38: The substrate susceptor of claim 37 comprising at least one cross piece (chuck 18) extending across the radial inner portion (of ring 22), see Fig. 6.

Regarding claim 39: The substrate susceptor of claim 38 wherein said cross piece is opaque to infrared radiation, see col.4 lines 4-21, the susceptor is made of aluminum.

Regarding claim 41: The substrate susceptor of claim 37 comprising at least two cross pieces (susceptor 14 and chuck 18) are made of different materials see col. 4 lines 28-34 extending across the radial inner portion.

Regarding claim 42: The substrate susceptor wherein said cross pieces are opaque to infrared radiation, see col. 4 lines 27-34.

5. Claims 13, 31-33, 37, and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Ohkase et al (US 5,536,918).

Regarding claim 13:Ohkase et al teaches a substrate susceptor for physically supporting a semiconductor substrate to be deposited upon, the susceptor (holder 3) comprising a body having a front substrate receiving side face comprising a body having a front substrate receiving side face comprising a bearing surface to physically support the semiconductor substrate to be deposited upon, a back side face, and a peripheral edge; the body comprising a ring (ring 33) having a radial inner portion at least a radial majority of which is non-solid space (see Fig. 12)

extending from the front side face to the back side face, the bearing surface being received on said ring.

Regarding claim 31:The substrate susceptor of claim 13 wherein the ring has a radially innermost surface which is continuous and round, see Fig. 12

Regarding claim 32: The substrate susceptor of claim radial inner portion is centered relative to the body, see Fig. 12.

Regarding claim 33:The substrate susceptor of claim 13 wherein the non-solid space is sized such that at least a majority of said substrate to be deposited upon will overlie said non-solid space, see Fig. 12.

Regarding claim 37: The substrate susceptor of claim 13 wherein only a portion of the radial inner portion is non-solid space, see Fig. 12.

Regarding claim 38: The substrate susceptor of claim 37 comprising at least one cross piece extending across the radial inner portion , see Fig. 12 (juncture between 33 and 32).

6. Claims 13, 31-33, 36, and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Osada et al (US 5,569,350).

Regarding claim 13:Osada et al teaches a substrate susceptor for physically supporting a semiconductor substrate to be deposited upon, the susceptor (holder 3) comprising a body having a front substrate receiving side face comprising a body having a front substrate receiving side face comprising a bearing surface to physically support the semiconductor substrate to be deposited upon, a back side face, and a peripheral edge; the body comprising a ring (ring 9) having a radial inner portion (9a) at least a radial majority of which is non-solid space (see Fig.

3 and the abstract) extending from the front side face to the back side face, the bearing surface being received on said ring.

Regarding claim 31:The substrate susceptor of claim 13 wherein the ring has a radially innermost surface which is continuous and round, see Fig. 3

Regarding claim 32: The substrate susceptor of claim radial inner portion is centered relative to the body, see Fig. 3.

Regarding claim 33:The substrate susceptor of claim 13 wherein the non-solid space is sized such that at least a majority of said substrate to be deposited upon will overlie said non-solid space, see Fig. 3.

Regarding claim 36: The substrate susceptor of claim 13 wherein all of the radial inner portion is non-solid space, when the pins have lifted the wafer from the susceptor 3 to ring 9 as depicted in Fig. 3.

Regarding claim 38: The substrate susceptor of claim 37 comprising at least one cross piece extending across the radial inner portion , see Fig. 3 (susceptor 3).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 3, 23, and 25-30 rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al (US 6,167,834) or AmRhein et al (US 2003/0215963) in view of Omstead et al (US 6,544,341).

Regarding claims 3, 23, and 27: Wang et al teaches a substrate susceptor for receiving a semiconductor substrate (wafer 15) to be deposited upon by thermal deposition comprising susceptor back side radiant heating, see col. 8 lines 24-42. The susceptor 16comprising a body having a front substrate receiving side, a back side, and a peripheral edge, see Fig.2 .

AmRhein et al teaches a substrate susceptor (support structure 18) for receiving a semiconductor substrate (wafer 16) to be deposited upon by thermal deposition comprising susceptor back side radiant heating, see [0028]. The susceptor 16 comprising a body having a front substrate receiving side, a back side, and a peripheral edge, see Fig.1 and 4 .

Wang et al or AmRhein fails to teach an outer material (coating) of Cu or polycrystalline diamond.

It is the examiner's position that the claimed outer material of the susceptor is produced from the residual deposition of the susceptor while a substrate is deposited upon. This layer of residual coating material would be on the outermost material of the susceptor. Furthermore, if Cu or polycrystalline diamond is used to deposit a film on the wafer, the susceptor will be deposited upon as well.

The teachings of Omstead et al confirmed the examiner's position and teaches Cu is a known suitable material of construction for thin films as recited in col. 2 lines 7-18, the background to his invention. Note col. 4 lines 20-25 teaches that when a copper film is deposited on a wafer, both the reaction chamber and the chuck tends to have a residual film of Cu upon the surfaces

thereon. Though, Omstead et al teaches that this residual deposition interferes with subsequent depositions it does/has occur(ed).

Regarding claim 25: Wang teaches that the body of the susceptor comprises such materials as those listed in col. 9 lines 45-50 among those listed is graphite coated with SiC . Wang et al teaches the motivation of using such materials as SiC coated graphite in col.9 lines 37-44 that these material can provide a thin, low mass, low thermal capacity, high emisiveity, with maxiumum efficiency, and a fast thermal response. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to use SiC coated graphite as the material of construction of the susceptor.

AmRhein et al teaches in sections [004], [009], and [0061] that the suscepor is made of SiC coated graphite.

Regarding claim 26: When the wafers of Wang et al or AmRhein et al are supported by susceptor there is no gap between the wafer and the front substrate receiving side of the susceptor and thus no outer material is received over outer portion of front substrate receiving side.

Regarding claim 28-30: The combined teachings of Wang et al or AmRhein with Omstead et al teaches the susceptor providing radiant heating to a wafer via near-IR lamps/heating elements where Cu the deposition film deposits onto a wafer and subsequently the components of the chamber including the susceptor. Neither Wang et al nor AmRhein et al as modified by Omstead et al teach the level of uniformity of the outer material nor the location of the greatest thickness of the material. However, these claim limitations are interpreted as process limitations and are optimizable. The uniformity of the outer material effects the uniformity of the heating the

wafer. It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such the location of the thickness amount of outer material and the level of uniformity through routine experimentation in the absence of a showing of criticality. In re Woodruff, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

9. Claims 3, 23, and 26-30 rejected under 35 U.S.C. 103(a) as being unpatentable over Stone et al (US 2002/0066551) in view of Omstead et al (US 6,544,341).

Regarding claims 3, 23, and 27: Stone et al teaches a substrate susceptor (chuck 10)for receiving a semiconductor substrate to be deposited upon by thermal deposition comprising susceptor back side radiant heating, see [0062]. The susceptor 10comprising a body having a front substrate receiving side, a back side, and a peripheral edge, see Fig.1 and 3 .

Stone et al fails to teach an outer material (coating) of Cu or polycrystalline diamond. It is the examiner's position that the claimed outer material of the susceptor is produced from the residual deposition of the susceptor while a substrate is deposited upon. This layer of residual coating material would be on the outermost material of the susceptor. Furhtermore, if Cu or polycrystalline diamond is used to deposit a film on the wafer, the susceptor will be deposited upon as well.

The teachings of Omstead et al confirmed the examiner's position and teaches Cu is a known suitable material of construction for thin films as recited in col. 2 lines 7-18, the background to his invention. Note col. 4 lines 20-25 teaches that when a copper film is deposited on a wafer, both the reaction chamber and the chuck tends to have a residual film of Cu upon the surfaces

thereon. Though, Omstead et al teaches that this residual deposition interferes with subsequent depositions it does/has occur(ed).

Regarding claim 26: When the wafer 15 is supported by susceptor 16 there is no gap between the wafer and the front substrate receiving side of the susceptor and thus no outer material is received over outer portion of front substrate receiving side.

Regarding claim 28-30: The combined teachings of Stone et al with Omstead et al teaches the susceptor providing radiant heating to a wafer via heater 16 where Cu the deposition film deposits onto a wafer and subsequently the components of the chamber including the susceptor. Neither Stone et al nor Omstead et al teach the level of uniformity of the outer material nor the location of the greatest thickness of the material. However, these claim limitations are interpreted as process limitations and are optimizable. The uniformity of the outer material effects the uniformity of the heating the wafer. It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such the location of the thickness amount of outer material and the level of uniformity through routine experimentation in the absence of a showing of criticality. In re Woodruff, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

10. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al (US 6,167,834) or AmRhein et al (US 2003/0215963) or Stone et al (US 2002/0066551) henceforth known as *the primary prior art* in view of Zimmer et al (US 6,054,183).

The teachings of Wang et al (US 6,167,834) or AmRhein et al (US 2003/0215963) or Stone et al (US 2002/0066551) were discussed above. All fail to teach an outer material of polycrystalline diamond.

It is the examiner's position that the claimed outer material of the susceptor is produced from the residual deposition of the susceptor while a substrate is deposited upon. This layer of residual coating material would be on the outermost material of the susceptor. Furthermore, when polycrystalline diamond is used to deposit a film on the wafer, the susceptor will be deposited upon as well.

Zimmer et al teaches the use of polycrystalline diamond as a material of construction in CVD. Zimmer al teaches the motivation of using polycrystalline diamond is that it is a material that can endure the wear and tear of the semiconductor manufacturing environment and has the versatilityy of usage in both dielectric and metallic environments see col.1. Thus, it would have been obvious for one of ordinary skill in the art to use polycrystalline diamond as a coating material to construct the outer material of the susceptor of the primary prior art.

11. Claims 34, 35, 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohkase et al.

The teachings of Ohkase et al were discussed above.

Regarding claims 34 and 35: Ohkase et al fails to recite how much the substrate overlies the non-solid space. This is an optimizable parameter wherein the size of the space is motivated or effected by the desired treatment upon the wafer and susceptor that is how much and what portion of each are to be treated. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to construct the susceptors of Ohkase et al to have at least 90% or at least 95% of the substrate overlying the non-solid space. Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one have ordinary

skill in the art to have determined the optimum amount of the substrate to overly the non-solid space of the susceptors of Ohkase et al.

Regarding claim 40: Ohkase et al teaches that the support unit 30 and ring 33 can be made of sapphire which the present invention in section [0078] is a material transparent to IR. The motivation to modify the susceptor of Ohkase et al to be constructed of sapphire instead of SiC coated graphite is that this material is known equivalent construction material as recited in col.13 lines 10-19. Ohkase et al teaches that sapphire is a material that has excellent heat resistance and little contamination. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to modify the susceptor of Ohkase et al to be constructed of sapphire (a material transparent to IR) instead of SiC coated graphite (a material opaque to IR).

12. Claims 34 or 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Osada et al.

The teachings of Osada et al were discussed above.

Regarding claims 34 and 35: Osada et al fails to recite how much the substrate overlies the non-solid space. This is an optimizable parameter wherein the size of the space is motivated or effected by the desired treatment upon the wafer and susceptor that is how much and what portion of each are to be treated. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to construct the susceptors of Osada et al to have at least 90% or at least 95% of the substrate overlying the non-solid space. Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one have ordinary

skill in the art to have determined the optimum amount of the substrate to overly the non-solid space of the susceptors of Osada et al.

13. Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arasawa et al in view of Okhase et al.

The teachings of Arasawa et al were discussed above. Arasawa et al fails to teach that the crosspiece (second layer of the chuck) is made of a transparent material.

Ohkase et al teaches that the support unit 30 and ring 33 can be made of sapphire which the present invention in section [0078] is a material transparent to IR. The motivation to modify the susceptor of Arasawa et al to be constructed of sapphire instead of SiC coated graphite is that this material is known equivalent construction material as recited in col.13 lines 10-19 of Ohkase et al. Furthermore, Ohkase et al teaches that sapphire is a material that has excellent heat resistance and little contamination. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to modify the susceptor of Ohkase et al to be constructed of sapphire (a material transparent to IR) or silica glass (silicon dioxide) instead of SiC coated graphite (a material opaque to IR).

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sylvia R. MacArthur whose telephone number is 571-272-1438. The examiner can normally be reached on M-F during the hours of 8:30 a.m. and 5 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Sylvia R MacArthur
Patent Examiner
Art Unit 1763

February 2, 2007